

WHAT IS CLAIMED IS:

1 1. A read channel, comprising:
2 an equalizer configured to equalize a digital signal to provide equalized
3 reproduced signals; and
4 a Viterbi detector capable of receiving the equalized reproduced signals and
5 converting the reproduced signals into a digital output signal indicative of data stored on
6 a recording medium;
7 wherein the equalizer is implemented using a lengthened equalization target
8 wherein the lengthened equalization target comprises a mathematical convolution of a
9 first and a second transfer function, the first transfer function comprising a predetermined
10 equalization target for providing desired shaping to the read signal and the second
11 transfer function comprising a matched filter function providing a time-reversed
12 component that is a time-reversed replica of a whitening filter component of the
13 equalization target.

1 2. The read channel of claim 1, wherein the predetermined equalization
2 target comprises a 16-state equalization target having a length of 7.

1 3. The read channel of claim 1, wherein lengthened equalization target is
2 symmetrical and comprises only two programmable parameters.

1 4. The read channel of claim 1, wherein coefficients of the lengthened
2 equalization target are independently adjustable while maintaining a DC null and a
3 desired Nyquist null.

1 5. The read channel of claim 1, wherein the lengthened equalization target
2 comprises a base partial response component, a fractional coefficient polynomial
3 component and a time-reversed replica of the fractional coefficient polynomial
4 component.

1 6. The read channel of claim 1, wherein the lengthened equalization target
2 has the form $(1-D^2)(1+p_1D+p_2D^2)(p_2+p_1D+D^2)$.

1 7. The read channel of claim 1, wherein the lengthened equalization target
2 has the form $(1+aD+bD^2-bD^4-aD^5-D^6)$, wherein a is equal to $(p_1/p_2) + p_1$ and b is equal
3 to $((p_1^2+1)/p_2)+p_2-1$.

1 8. The read channel of claim 7, wherein a and b are programmable.

1 9. A signal processing system, comprising:
2 memory for storing data therein; and
3 a processor, coupled to the memory, for equalizing a digital signal to provide
4 equalized reproduced signals using a lengthened equalization target, wherein the
5 lengthened equalization target comprises a mathematical convolution of a first and a
6 second transfer function, the first transfer function comprising a predetermined
7 equalization target for providing desired shaping to the read signal and the second
8 transfer function comprising a matched filter function providing a time-reversed
9 component that is a time-reversed replica of a whitening filter component of the
10 equalization target.

1 10. The signal processing system of claim 9, wherein the predetermined
2 equalization target comprises a 16-state equalization target having a length of 7.

1 11. The signal processing system of claim 9, wherein lengthened equalization
2 target is symmetrical and comprises only two programmable parameters.

1 12. The signal processing system of claim 9, wherein coefficients of the
2 lengthened equalization target are independently adjustable while maintaining a DC null
3 and a desired Nyquist null.

1 13. The signal processing system of claim 9, wherein the lengthened
2 equalization target comprises a base partial response component, a fractional coefficient
3 polynomial component and a time-reversed replica of the fractional coefficient
4 polynomial component.

1 14. The signal processing system of claim 9, wherein the lengthened
2 equalization target has the form $(1-D^2)(1+p_1D+p_2D^2)(p_2+p_1D+D^2)$.

1 15. The signal processing system of claim 9, wherein the lengthened
2 equalization target has the form $(1+aD+bD^2-bD^4-aD^5-D^6)$, wherein a is equal to $(p_1/p_2) +$
3 p_1 and b is equal to $((p_1^2+1)/p_2)+p_2-1$.

1 16. The signal processing system of claim 15, wherein a and b are
2 programmable.

1 17. An equalizer implemented in accordance with a lengthened equalization
2 target wherein the lengthened equalization target comprises a mathematical convolution
3 of a first and second transfer function, the first transfer function comprising a
4 predetermined equalization target for providing desired shaping to the read signal and the
5 second transfer function comprising a matched filter function providing a time-reversed
6 component that is a time-reversed replica of a whitening filter component of the
7 equalization target.

1 18. The equalizer of claim 17, wherein lengthened equalization target is
2 symmetrical and comprises only two programmable parameters.

1 19. The equalizer of claim 17, wherein coefficients of the lengthened
2 equalization target are independently adjustable while maintaining a DC null and a
3 desired Nyquist null.

1 20. The equalizer of claim 17, wherein the lengthened equalization target
2 comprises a base partial response component, a fractional coefficient polynomial
3 component and a time-reversed replica of the fractional coefficient polynomial
4 component.

1 21. The equalizer of claim 17, wherein the lengthened equalization target has
2 the form $(1-D^2)(1+p_1D+p_2D^2)(p_2+p_1D+D^2)$.

1 22. The equalizer of claim 17, wherein the lengthened equalization target has
2 the form $(1+aD+bD^2-bD^4-aD^5-D^6)$, wherein a is equal to $(p_1/p_2) + p_1$ and b is equal to
3 $((p_1^2+1)/p_2)+p_2-1$.

1 23. The equalizer of claim 22, wherein a and b are programmable.

1 24. A magnetic storage device, comprising:
2 a magnetic storage medium for recording data thereon;
3 a motor for moving the magnetic storage medium;
4 a head for reading and writing data on the magnetic storage medium;
5 an actuator for positioning the head relative to the magnetic storage medium; and
6 a data channel for processing encoded signals on the magnetic storage medium,
7 the data channel comprising an equalizer implemented in accordance with a lengthened
8 equalization target wherein the lengthened equalization target comprises a mathematical
9 convolution of a first and second transfer function, the first transfer function comprising a
10 predetermined equalization target for providing desired shaping to the read signal and the
11 second transfer function comprising a matched filter function providing a time-reversed
12 component that is a time-reversed replica of a whitening filter component of the
13 equalization target.

1 25. The magnetic storage device of claim 24, wherein the predetermined
2 equalization target comprises a 16-state equalization target having a length of 7.

1 26. The magnetic storage device of claim 24, wherein lengthened equalization
2 target is symmetrical and comprises only two programmable parameters.

1 27. The magnetic storage device of claim 24, wherein coefficients of the
2 lengthened equalization target are independently adjustable while maintaining a DC null
3 and a desired Nyquist null.

1 28. The magnetic storage device of claim 24, wherein the lengthened
2 equalization target comprises a base partial response component, a fractional coefficient
3 polynomial component and a time-reversed replica of the fractional coefficient
4 polynomial component.

1 29. The magnetic storage device of claim 24, wherein the lengthened
2 equalization target has the form $(1-D^2)(1+p_1D+p_2D^2)(p_2+p_1D+D^2)$.

1 30. The magnetic storage device of claim 24, wherein the lengthened
2 equalization target has the form $(1+aD+bD^2-bD^4-aD^5-D^6)$, wherein a is equal to $(p_1/p_2) +$
3 p1 and b is equal to $((p_1^2+1)/p_2)+p_2-1$.

1 31. The magnetic storage device of claim 30, wherein a and b are
2 programmable.

1 32. An equalizer implemented in accordance with means for shaping a
2 channel impulse response to a desired target shape, the means for shaping comprises a
3 first means for providing desired shaping to the read signal and a second means for
4 providing a time-reversed component that is a time-reversed replica of a whitening filter
5 component of the means for shaping.